

REMARKS

The Office Action of March 29, 2004 has been received and its contents reviewed. Applicant would like to thank the Examiner for the consideration given to the above-identified application.

By this Amendment, claim 1 has been amended, and new claim 10 has been added. Claims 2-9 have been previously withdrawn. Accordingly, claims 1 and 10 are pending for consideration.

Turning to the Office Action, claim 1 stands rejected under 35 U.S.C. §112, second paragraph, as indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Specifically, the Examiner is unclear whether the feature of "separating an upper portion of the plurality of adjacent contact holes" in lines 18-19 of claim 1 is the same step as "to separate the plurality of adjacent contact holes" in lines 12-13. In response, Applicant has amended claim 1, as shown above, to clarify the claim language, specifically to delete "plurality of contact holes" and to add "first contact hole", "second contact hole" and "third contact hole" where appropriate.

Further, claim 1 is rejected under 35 U.S.C. 102(e) as anticipated by Jang (U.S. Patent No. 6,235,633 B1). These rejections are respectfully traversed at least for the reasons provided below.

Before discussing the differences between the presently claimed invention and that of Jang, Applicant will explain the present invention by referring to the drawing figures of this application below.

In the present invention, the separations between the plurality of contact holes (i.e. first, second, and third contact holes) are different, and the contact holes have a tapered portion at an upper end thereof. Accordingly, as shown in, e.g., Fig. 1D, due to the tapered portion at the upper end of the interlayer insulator film, the height of the interlayer insulator film provided between the contact holes with narrow separation is lower than the height of the interlayer insulator film provided between the contact holes with wide separation. Hence, even if the conductive material film is removed until the interlayer insulator film provided between the contact holes with wide separation is exposed, the surface of the interlayer insulator film provided between the contact holes with narrow separation is not exposed. As a result, since such contact holes are connected by the conductive material film provided on the

interlayer insulator film, short-circuit is caused between the contact holes due to the conductive material film.

According to amended claim 1, in order to prevent short-circuit between the second and the third contact holes, the conductive material film retained between the second and the third contact holes is removed, the tapered portion of the interlayer insulator film is removed and exposed, and the upper portion of the contact holes is separated.

On the other hand, in the method disclosed in cited reference Jang and as clearly shown in Fig. 5, the metal layer 28 is removed by the first CMP, and the surface of the hard mask layer 22 provided between the adjacent contact holes 2 is exposed. Since the surface of the hard mask layer 22 provided between all the adjacent contact holes is exposed, no metal layer 28 or hard mask layer 22, whose surface is not exposed, exists between the contact holes. Hence, the structure of Jang is different from that of the present invention and does not have the problem that the presently claimed invention addresses.

In contrast with Jang, as shown in the step (d) of the amended claim 1 of the present invention, the conductive material film is removed until the surface of the interlayer insulator film provided between the first and the second contact holes is exposed, and the surface of the interlayer insulator film provided between the second and the third contact holes is not exposed even if the first and the second contact holes are separated, and the conductive material film is retained on the second and the third contact holes.

Further, as shown in Fig. 6 of Jang, after the first CMP, the thin hard mask layer 22 (see Fig. 5) retained between the adjacent contact holes 2 is removed by the second CMP, and the surface of the interlayer insulator film 20 that was not being exposed is exposed, and the upper portions of the adjacent contact holes 2 are separated. However, Jang fails to disclose a step for removing the conductive material film retained between the adjacent contact holes, as recited in step (e) of amended claim 1. Thus, Jang is different from the presently claimed invention.

As discussed above, Jang fails to disclose the steps (d) and (e) of the present invention. In other words, Jang fails to disclose the features of the present invention such that in order to form a plug in the contact hole, even if the conductive material film is removed until the surface of the interlayer insulator film between the first and second contact holes is exposed, the surface of the interlayer insulator film between the second and third contact holes is not exposed and the conductive material film is retained. Hence, Jang also fails to disclose the effect of preventing short-circuit caused by the retained conductive material film.

In column 6, lines 55-65, Jang discloses minimizing electrical shorts caused by the metal film between the plugs in the second CMP step. However, as clearly shown in Fig. 5, since the metal layer 28 is completely removed from the portion between the plugs before performing the second CMP, nothing that corresponds to the retained conductive material film of the present invention exists between the contact holes. Hence, it can be assumed that the metal film disclosed in Jang is extremely fine and merely has the effect of preventing shorts of low frequencies. On the other hand, the conductive material film provided between the second and third contact holes in the step (e) of the present invention is connected between the contact holes, as shown in the cross sectional diagram of Fig. 1D of the present specification, and thus the structure disclosed in the step (e) is to prevent the short-circuit that certainly would be caused by the conductive material film. Hence, the effect of the present invention is different from that of Jang. For the foregoing reasons, the present invention is distinguishable from Jang.

Consequently, since each and every feature of the present claims is not taught (and is not inherent) in the teachings of Jang, as is required by MPEP Chapter 2131 in order to establish anticipation, the rejection of claim 1 under 35 U.S.C. §102(e) as anticipated by Jang is improper.

Dependent claim 10 has been added to further cover the scope of the invention in which Applicant is entitled. Support for claim 10 can be found in, e.g., Fig. 1(d).

In view of the amendments and arguments set forth above, Applicant respectfully requests reconsideration and withdrawal of all the pending rejections.

While the present application is now believed to be in condition for allowance, should the Examiner find some issue to remain unresolved, or should any new issues arise, which could be eliminated through discussions with Applicant's representative, then the Examiner is invited to contact the undersigned by telephone in order that the further prosecution of this application can thereby be expedited.

Respectfully submitted,



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